Demand, Supply and Projects Scenario of Water Resource in India

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ABSTRACT

Present paper is concerned with the study on the problem of demand and supply scenario of water resources mentioning the concept of inter basin transfer of water in India. Due weightage has been given on the techniques of artificial recharge of ground water along with basin development with some suggestions for meeting the challenge in the near future in the arena of rapid increase of population in our country.

INTRODUCTION

Water is the most basic human need. Moreover it is a sine question for most human activities that fulfil the socio-economic needs of a country. These needs may be grouped under different sectors like (1) domestic (2) irrigation (3) energy (4) industrial and (5) others. Through there multisectoral uses, water ramifies so much into our day to day activities that we have become oblivious of its value and have tended to take it for granted. Moreover, due to its renewable nature, it has so long been considered as an inexhaustible gift of nature. However, of late, there has been a sharp change in this perception throughout the world. Phenomenal rise in population coupled with the prevailing social need to raise living standard has necessitated rise in demand of water in all sectors of use. Pollution of different sources of water from various causes has, on the other hand, brought down the availability of water of adequate quality. As a result water has emerged as a scarce commodity in many parts of the globe; India is no exception.

This note of alarm has necessitated an assessment of the water resources of the country, match the emerging demands of the coming decades with the available supply and to plan future water resources development (WRD) strategies to avoid any mismatch between demand and supply of this precious natural resources.

DEMAND

Recent studies reveal that the demand in all sectors of water uses was about 55.2 M ha m. in 1990 and 75.0 M ha m in 2000 respectively. Further, water needs in 2025 A.D. are estimated to be 105.0 M ha m. The following table may be examined in this respect.

Table 1 present and Future water demand

Purpose			
Domestic use	2.5	3.3	5.2
Irrigation	46.0	63.0	77.0
Energy	1.9	2.7	7.1
Industrial use	1.5	3.0	12.0
Other	3.3	3.0	3.7
Total	55.2	75.0	105.0

An examination of the table above reveals that irrigation demand is the largest for all the years. In the terms of total utilization irrigation demand accounts for 83%(1990), 84%(2000), and 73%(2025) respectively. The decrease in percentage in 2025 from that of 2000 is perhaps an indication that irrigation demand has to be restrained from present wasteful use in preference to domestics and industrial demands in future. This fact further accentuates the urgent need for conservation of water resource in the irrigation sector.

SUPPLY

SURFACE WATER

The average annual precipitation over the country is about 1194 mm, which when considered over the geographical area of 328 million hectares (M ha.) amount to 392 million hectare

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(M ha m). Considering the contribution of snowfall, which is not yet folly recorded, this may be rounded off to 400M ha m. Out of the total precipitation, a part seeps down underground towards adding to the ground water storage, a part goes up into the atmosphere as evaporation and transpiration and the remaining quantity accounts for the surface water. The average annual surface water resources in the country is estimated to be 187.0 M ha m. Due to tropical climatic conditions, India experiences wide temporal and spatial variations in the occurrence of precipitation. In fact, over 90% of the annual flow in peninsular rivers and over 80% of that in Himalyan Rivers occur during the four monsoon months of June to September. Although the average annual precipitation of the country is 1194mm as stated already, it stoops to as low as 100mm in western Rajasthan and rises to as high as over 11,000mm near Cherrapunji in Meghalaya. As a result, an increasing deficit between demand and supply is being experienced chronically in some parts of the country. Some other parts of the country, however, experience water shortage occasionally. One the other hand, there are occasions when some parts of the country experience an excess of precipitation and face inundation.

The temporal and spatial imbalance between demand and supply leads to the need to create storage water in a reservoirs by building dams, large and small, and diversion canals to distribute the stored water in a regulated manner. This distribution may be effected within a river basin or transferred to a deficit basin through long distance inter basin transfer. But there are physiographical and technological constraints and complex inters state issues which preclude the storage of the entire surface flow. A recent study conducted by the Central Water Commission (CWC) indicates that the quantity of utilizable water resources through surface structures is limited to about 69.0 M ha m. But inter basin transfer may augment this quantity to some extent.

STORAGE SCENARIO

If a reasonable forecast can be hazarded, in 2050 A.D. when the population is likely to be stabilized, the total demand in all probability will not be less than the total utilizable quantity, i.e., 114.0 M ha m. To achieve this level of utilization, apart from utilization of the entire ground water potential, adequate additional storage facilities have to be created to utilize the surface flow. The total storage created in the country, putting together those being created and also those being contemplated, would provide about 40.0 M ha m. In order to utilize the entire estimated utilizable surface flow, it is estimated that approximately a total of 56.0 M ha m of storage capacity created would have to be created. This estimate is on the basis of an assumption that each cubic metre of storage capacity created would enable utilization of approximately 1.25 cubic metre of water resource annually. So it still remains to identify and create further storage capacity of 16.0 M ha m.

RESISTANCE TO CREATION OF STORAGE

A few stray comments appearing in the media were almost devastating:

"Suddenly come the planners and contractors to brutally uproot a million people without even taking their opinion. They never seek the opinion of the indigenous people, and are often undertaken for political gains and the contractor bureaucrat nexus is the main beneficiary. Never the poor."

"Gujrat Chief Minister talks of the project as an article of faith. Faith perhaps in the engineering and the economic aspects of the projects; the people could be damned with the river."

The harsh criticism was naturally not sweet music to the ears of the technocrats and associated WRD groups. Soon two compartmentalized hostile groups emerged, one for the large WRD projects and the other vehemently opposing the very rationale of these projects. There was very little appreciation of the views of the other group. The air was very much charged with accusations and counter accusations and amidst this din and bustle, the objective of both the groups that is how to ensure development with least interference to the environment was probably forgotten. In this situation the romantically named Silent Valley project in Kerala was abandoned because a rare specie of Lion Tailed Monkey inhabiting the primeval forests of the valley was threatened. The Narmada projects has been relentlessly dogged mostly on the issues of

rehabilitation of the oustees and loss of forests including rare species of flora and fauna in the projected reservoir area. In the case of the Tehi Dam, over and above these issues, the question of probable failure due to earthquake and consequent disaster became very much tenacious.

"In the final analysis, the ultimate objective of the two interest groups on environment and development issues has to be the same; how to ensure environmentally sound development."

Without going into the pros and cons of such controversies, it can be safely assumed that implementation of such projects will be increasingly difficult in the coming years. The prospects are further hindered by the fact that most of technologically more difficult and economically favourable sites have been already exploited and the remaining sites are technologically more difficult and economically more expensive. Thus, the prospects of addition to the existing availability of water through more storage in reservoirs will remain quite uncertain in the coming years.

GROUND WATER

Ground water is another source of supply of water. Quantity of water, which can be withdrawn economically from the aquifers annually within the renewable capacity of the aquifers, is generally reckoned as the ground water potential. From preliminary estimates conducted by the Central Ground Water Board (CGWB), It is estimated that the ground water potential of the country is 45.0 M h m.

Ground water is little difficult to assess and utilize, as because its movement is not visible and substantial survey and investigation including field tests have to be carried out before a dependable picture emerges. Availability is dependent on the sub surface geological formations and the source of supply, which is again dependent upon the rainfall pattern and the infiltration capacity of the catchment area. However, with latest technology, it is possible to estimate the safe yield of an aquifer reliably. Moreover ground water can be developed at a small capital cost and the time taken for development is very small. The quality of ground water is found to be generally good and can be used for drinking, agriculture and industrial purposes.

TOTAL SUPPLY

Although there are indications that ground water potential may finally emerge slightly higher than the above value and large scale inter basin transfer of surface flows may augment the utilisable surface flow, yet at this stage it is safe to assume that the total utulisable water resources from all sources is 114.0(69.0+45.0) M ha m.

FUTURE WRD STRATEGIES

From the above discussion on demand and supply of water resources it is apparent that in the coming decades scarcity of water will emerge as a serious challenge. Apparently there are three available strategies to meet this challenge. Firstly, the rising demand can be restrained through population control and change over to a life style demanding less and less of the modern day attributes of high living. Secondly, by augmentation of resources through inter basin transfer and thirdly by adopting strict conservation measures in all sector of water use. The first one concerns social perceptions and is beyond the general scope of this paper and will be touched upon in the concluding stage. But the next two strategies deserve some elaboration

INTER BASIN TRANSFER

For meeting the shortage in deficit regions, long distance inter – basin transfers of water from surplus regions may be considered necessary. This may also lead to an optimal and equitable utilization of the surplus water resources in various regions of the country. Suggestions for inter-basin transfer to create a balance between surplus and deficit basins have been made from time to time; but two proposals put forward in the seventies viz (1) Garland Canal by Captain D.J. Dastur (1977) and (2)National water Grid by Dr. K.L. Rao(1979) gained considerable attention. Both the proposals were examined by the Central Water Commission and other expert authorities. Dastur's proposal was found to be technically unsound and economically prohibitive and was not considered worth following up and was dropped. Similarly Rao's proposal was found to be grossly under-

estimated, dependent on large blocks of power (5 to 7 million kw.)for its functioning and having no flood control benefits. Therefore this proposal was also not pursues further. There were other proposals also from eminent engineers, consultants, professors, chambers of commerce etc. On long distance inter-basin transfer of water. These proposals were examined and found to be at best preliminary and conceptual and could not be considered as alternatives worth serious considerations. But the continued interest shown by various segments of society in inter- basin transfer compelled the Ministry of Water Resources, Govt. of India to formulate a National perspective for Water Development in August 1980. In this perspective, stress was put inter alia on reasonable needs of the surplus basin-states in the foreseeable future and most efficient use of land and water in the entire country. The National Water Development Agency, NWDA was set up in 1982 by the Govt. of India to study the feasibility of the National Perspective consisting of 36 water transfer link proposals. The studies are still continuing. Apparently there are no insurmountable technical problems for execution of these proposals.

ARTIFICAL RECHARGE OF GROUNDWATER

In certain high demand areas, where ground water withdrawal has already reached a critical limit, a number of problems emerge. Firstly, the demand outstrips supply; secondly, declining ground water level increases pumping costs & brings in its wake environmental problems including salinity ingress in coastal areas and occasionally emergence of toxic materials like Arsenic etc. These problems call for immediate steps to arrest the declining trend of ground water and reverse it if possible. Artificial recharge involves augmenting the natural movement of surface water into underground formations by some method of construction, by spreading of water or by artificially changing natural conditions.

Some pilot projects involving construction of structures like spreading basins, percolation tanks and subsurface dykes are already on the way. Spreading basins may be created conveniently in existing basing through additional feeding from existing canals of rain water harvesting. Sandy or rocky soil provides favourable condition for the success of percolation tanks, since water can quickly percolate underground through pores in the sol or fissures and cracks in the rock formations. Sub- surface impermeable dykes can be constructed on the highly permeable bed of a river across its width to prevent quick downstream sub-surface flow.

FITURE PERSPECTIVE

In future, new large scale WRD projects are practically out of consideration due to social opposition. The reasons for this opposition may be enumerated as below:

- Very large investments are involved
- Performance of the completed projects has not, in general, fulfilled the anticipated targets.
- Financial returns in terms of revenue earnings have been almost insignificant due to many reasons.
- Impact on the environment has been significant. This aspect, particularly regarding rehabilitation of project affected people and submersion of forest area including rare species of flora and fauna has not been considered acceptable by social activists.
- Any proposal for Inter Basin Transfer will raise all the resisting factors mentioned above. Moreover goodwill of the surplus basins will be necessary before implementation of any such project can be intended. So prospect of any such project being implemented in the near future is remote.

To meet future demands more and more emphasis will be paid to conservation of the resource in all sectors of water use. Conservation is achieved through limitations, if not, total elimination of wastage and losses and optimal use in all sectors. In this respect example of arid developed regions of the world can be of much benefit.

BASIN DEVELOPMENT

The National Water policy, 2002recommends that," Water resources planning, development and management will have to be done for a hydrological unit such as drainage basin as

a whole or for a sub-basin, multi-sectorally, talking into account surface and ground water for sustainable use." This is a very sensible proposition. Essentially this recommendation calls for assessment of resources and multi-sectoral demands in the basin and planning and implementation of necessary infrastructure to match the demand. In short, this arrangement may be termed as "Total Water Management" while planning for total water management of a basin it may be found that the resources available within the precincts of the basin is woefully short of occasionally the surplus may be so large as to create most unwanted flood conditions resulting in widespread distress and damage.

Information on some major projects

Central Govt, has declared 14 water resources projects indicated in the Table as National Projects. For these projects, 90% project cost of irrigation, drinking water component is to be provided as Central Grant.

The Union Cabinet in its meeting held on 7th Feb. 2008, constituted a "High Powered Steering Committee for Implementation of the Proposals of National Projects" with the Secretary (WR) as Chairman and Chief Engineer (PPO), CWC as Member-Secretary with the terms of reference as under:

i. To recommend implementation strategies for National Projects.

ii.To monitor implementation of National Projects.

iii.To examine the proposal (if any) for inclusion of new projects as National Projects and make appropriate recommendation to the Government.

During 2010-11, Central assistance of Rs. 1412.94 Cr. (Rs. 635.28 Cr.+ Rs. 777.66 Cr.) for Gosikhurd Project, Rs. 81.00 Cr. for Teesta Barrage Project and Rs. 15.236 Cr. for Shahpurkandi Project were released. A potential of 719.00 ha. was created up to November, 2010 from Gosikhurd Project during 2010-11.

List of National Water Resources Projects

SI. No.	**Name of the Project**	**1) Irrigation (ha.) 2) Power (MW) 3) Storage (MAF)**	**State**
1.	Teesta Barrage	9.23 lath ha. 1000 MW Barrage	West Bengal
2.	Shahpur Kandi	3,80 lakh ha. 300 MW 0.016 MAF	Punjab
3.	Bursar	1 lakh ha. (indirect) 1230 MW 1MAF	Jammu & Kaslimir
4.	2nd RavtVyas Link	Harness water flowing across border of about 3 MAF	Punjab
5.	Ujh Multipurpose Project	*0.3T lakh* ha. 280 MW 0.66 MAF	Jammu & Kashmir
6.	Gyspa Project	0.50 lakh ha. 240 MW 0.6 MAF	Himachal Pradesh
7.	Lakhvar Vyasi	0.49 lakh ha. 420 MW 0.325 MAF	Uttranchal
8.	Kishau	0.97 lakh ha. 600 MW	Himachal Pradesh /Uttranchal

		1.04 MAF	
9.	Renuka	drinking water 40 MW 0.44 MAF	Himachal Pradesh
10.	Noa-Dehang Dam Project	8000 ha. 75 MW 0.26 MAF	Arunachal Pradesh
11.	Kulsi Dam Project	23900 ha. 29 MW 0.28 MAF	Assam
12.	Upper Siang	Indirect 9500 MW 17.50 MAF & Flood moderation	Arunachal Pradesh
13.	Gosikhurd	2.50 lakh ha. 3MW 0.93 MAF	Maharashtra
14.	Ken Betwa	6.46 lakh ha. 72 MW 2.25 MAF	Madhya Pradesh

CONCLUSION

Throughout the ages attempts have been made to meet the demands of the people for a higher standard of living. In all these attempts, the natural resources have been modified or manipulated by the innovative capability of mankind to create newer and better objects or methods to meet the spiraling demands of a burgeoning population. But there is a limit to this exploitation of the natural resources. Perhaps we have reached a stage in this face for higher and still higher standards of living when we must take a stock of the past and anticipate the future if we continue to live with our present extravagant life style. Even a modest forecast gives us a most depressing scenario. If the life sustaining boons of the resources like air, water and land are irreversibly damaged due to over exploitation, then the very foundation of the structure of the human society will be in jeopardy and perhaps the Homo Sapiens will face the biggest challenge of its life, reminding us of Prince of Denmark's dilemma "To be or not to be."

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